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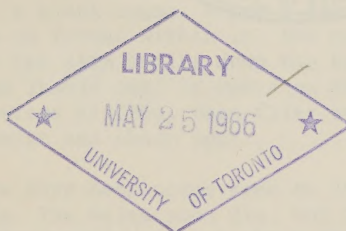
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HOW TO CONTROL MOSQUITOES

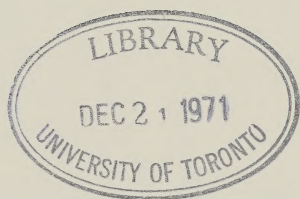


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HOW TO CONTROL MOSQUITOES

by

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Canada has some of the most extensive and productive mosquito breeding grounds to be found anywhere. Nearly 60 different kinds of mosquito breed in our swamps and pools.

Although not important here as carriers of disease, mosquitoes are a major pest. This short article may help you beat the problem.

WHAT TO LOOK FOR

There are four stages in the life cycle of a mosquito: the egg, the larva, the pupa and the adult. The eggs are pale, cigar-shaped, and about 1/16 inch long when first laid, but they soon turn black on exposure to light and air. They are laid on water, or on the ground in damp places. The larva is the well-known "wiggler" often seen in rain barrels. It feeds on tiny particles of plant or animal matter found in water, and grows by shedding its skin and emerging into progressively larger stages. It goes through four such molts, then it changes into a pupa, which looks somewhat like a black comma. After a few days, during which the adult fly is formed within it, the pupa floats at the surface while its skin splits down the back and the mature mosquito drags itself out. It rests on the empty skin while its legs and wings stiffen, then flies away to rest under leaves in a moist and shady spot.

For a few days both sexes feed on the nectar of flowers, then they mate. The males soon die, but the females go in search of a blood meal, without which they cannot form eggs. The engorged females rest again for a few days, then deposit their eggs in a suitable spot. Most species do not live very long after this, but some are able to repeat the cycle of blood-sucking and egg-laying several times.

PLAN YOUR CONTROL CAMPAIGN

Spring and early summer are the times to control mosquitoes but it is best to plan your campaign months ahead of this. Organize a control committee and select capable field workers. Get maps of the area on the largest possible scale. Mark off the maps into convenient sections and give each section a letter. Go over each section thoroughly and mark on the map the position of every spot that holds water or that will do so in spring. Number each breeding spot as it is entered on the map. If any pools or swamps can be wiped out by a simple ditching or filling job, get that done, or mark it for future engineering work.

If you have planned your work well ahead you will have checked for standing water in spring; you will have gone over the ground thoroughly to find out when and where the larvae were developing; and you will have visited every breeding spot and tested for the presence of larvae.

METHODS OF CONTROL

Get Rid of Standing Water

No mosquito can hatch or develop anywhere but in standing water. The most complete control method, then, is to remove every body of water in which larvae can breed. This is called source reduction, which is done by ditching swamps, filling in low spots, dyking against floods, and emptying or removing artificial containers.

For heavy source-reduction work, only the largest control districts will need to buy their own earth-moving equipment. Most will find it better to lease the machinery, or to let the work out on contract.

Attack the Larvae (Larviciding)

The next best method is to attack the larvae. Mosquito larvae must live in water. Here they cannot get away from you. The problem is to treat the water in such a way that the larvae cannot live in it, but at the same time avoid killing fish or other insects on which the fish may feed. Bear in mind that insecticides are poisons, and must not be scattered around without due care. There is no chemical yet known that will kill mosquitoes and nothing else.

For many years larvae were killed by a film of oil such as diesel or kerosene sprayed on the water. This method is not altogether satisfactory for several reasons. It requires a large amount of oil; if the oil is too heavy it does not spread completely; and if it is too light it soon evaporates. Furthermore, oil does not spread through dense plant growth, and if used on meadows it "burns" the hay.

After 1946, DDT, lindane, chlordane, and other related chemicals were used. They were highly effective in small quantities, and were long-lasting. However, they proved to be poisonous to many other forms of life, and their use is now much restricted. More recently, two other families of chemicals, carbamates and organophosphates, have been introduced. They are highly effective but once their work is done they soon break down and become harmless. Table 1 suggests materials that may be used in various situations, but rapid changes are constantly taking place in the field of insecticides, and before starting any large-scale work you should consult your provincial entomologist or public health department.

Prehatching Treatments. In areas where there is no possibility of contaminating streams, crops or pastures, you may find it convenient to apply a long-lasting material such as DDT before the spring thaw, when soft ground is frozen and demands on labor are not heavy. Where breeding areas are known from previous experience, an application of DDT in the form of granules, oil solution, or wettable powder at the rate of 0.5 lb per acre will do the job.

Immediate Treatments to Kill Larvae. When hatching has started, alert the larviciding crew and start treatment. Do not wait until pupae appear, as they are much harder to kill.

If the waters do not drain directly into streams you may use DDT as an oil spray or in granules, at the rate of 0.25 lb per acre. If there is any danger to fish, use fenthion (Baytex) at 0.05 lb per acre.

Aircraft Spraying. Where widespread areas or inaccessible places are to be treated, aerial spraying often proves economical. This is usually done by commercial operators familiar with the work and any legal restrictions that may be in force locally. They can usually supply the best material and know how to use it.

There are several advantages in the use of aircraft. Aircraft can cover ground that is too rough or too soft for ground machinery; a large area can be covered in a very short time; and the use of an airplane may save a district a large investment in ground equipment.

There are also some disadvantages to their use. The insecticide may drift into areas that must not be contaminated; aircraft spraying is greatly dependent upon atmospheric conditions; and weather will sometimes make spraying impossible for days at a time.

Killing Adult Mosquitoes (Adulticiding)

Once the adult mosquitoes are on the wing their reduction becomes difficult and costly. However, there are times and places where it must be attempted. The various methods are given in Table 2.

In homes, commercial aerosols in pressure cans are most convenient, but equally good results can be had by spraying with a combination of DDT, pyrethrins and piperonyl butoxide, a mixture that can be bought as a prepared concentrate. Dilute it according to directions on the label and apply it with a small hand sprayer of the "flit-gun" type.

For a residual deposit in dairy barns, spray the inside surfaces with naled, 1 percent solution in water at 2 gal per 1000 sq. ft.

Adulticiding outdoors can be done by several methods, but none of these will give permanent control. When an area has been cleared of mosquitoes it may stay that way for a few hours or a few days, but reinfestation will take place from the surrounding country.

Fogging is an efficient method when properly done. It should be done in early evening or morning, when the air is still and there are no updrafts, or on overcast days. At such times fog will roll with the wind and stay close to the ground. At other times it will rise in the air and blow uselessly away.

Fog can be produced by a wide range of generators, from small attachments working on the exhaust of power lawn mowers to truck-mounted machines that put out large volumes. To fog an area, start the generator and draw it slowly

(4 to 5 mph) at right angles to the direction of the wind in a series of swaths. The larger machines are effective for 100 to 300 yards downwind, and the smaller ones in proportion. In open country a wind speed of 2 to 4 mph is ideal, but in the woods the best results occur with the wind (above the trees) at 6 to 10 mph. The insecticidal material may be DDT at 0.2 to 0.4 lb per acre, or malathion at 0.07 to 0.1 lb per acre, both as a 5 percent solution in No. 2 fuel oil. Fogging leaves no residual deposit on foliage.

To get long-lasting protection for enclosed spaces such as barns and warehouses, use dichlorvos dispensers, which are in the form of resin strips. This material is volatile and produces enough vapor to control mosquitoes and other flies for a season. It is recommended for use in homes.

Selecting Your Equipment

Personal equipment consists of waders for survey work, and protective clothing for those engaged in mixing or applying chemicals. Use plastic or rubber gloves and aprons when handling the safer materials, and coveralls with respirators for the more highly toxic ones. Your local public health department can advise you if the materials you plan to use call for special precautions.

For applying insecticides a wide range of sprayers is available. The simplest is the common hand sprayer, which can be used for indoor work or for treating artificial containers. The bulk of hand work outdoors is done with the portable compressed-air sprayer. This has a capacity of one to five gallons, and is usually slung from shoulder or back. Power-operated sprayers can handle large volumes of material, and will spray a greater distance than the hand machines. Another useful type can be carried on the back, and can be adapted to dispense dusts or granules as well as mists or sprays. Other power machines range in size up to truck-mounted sprayers or a large capacity.

Mist blowers can be used for both larviciding and adulticiding. They operate by injecting liquid spray into a powerful air blast, which can be turned in any direction. These also range in size from the back-pack machine mentioned above to those taking several hundred gallons at a filling.

Fog generators also are found in many sizes. They operate by injecting an oil solution of insecticide into a blast of heated air or steam. This breaks down the oil into fine droplets that drift in the air and settle out very slowly. The smallest generators are attachments that can be applied to the exhaust manifolds of light air-cooled motors. Other complete units may be held by the hand, and operate on the pulse-jet principle. The largest are truck-mounted units that use an oil or gas furnace to heat the air blast, and have an output of up to a hundred gallons per hour.

PROTECT YOURSELF

In places where mosquitoes cannot be controlled outside, equip your home with screens. The mesh should not be less than 16 x 16 per square inch, and rustproof materials such as galvanized wire, copper, or plastic will more than repay any added initial cost. When camping, use a tent with a sewn-in floor and an extra flap of screen material that can be tightly closed. Before retiring clear out any mosquitoes in the tent with a pressurized aerosol spray. Once you are in for the night, keep the screen front closed.

Repellents are useful for those engaged in outside activity, but the length of protection they give varies with circumstances. A good modern repellent will give comfort for most of the day to a holiday stroller, while a man doing heavy work will need an application every hour or so. There is a wide choice of repellent formulations, liquid, cream, or spray, under different trade names. Of the active ingredients in these, the best presently available is diethyl toluamide. Dimethyl phthalate and Rutgers 612 are also quite good.

CAUTION

ALWAYS follow the directions and observe the precautions stated on insecticide labels.

TABLE 1
FORMULATIONS AND EQUIPMENT FOR CONTROLLING MOSQUITO LARVAE ACCORDING TO LOCATION

Location	Insecticide	Equipment	Formulation	Dosage
Isolated pools, seepages, flooded bottoms cut off from streams	DDT	Portable compressed- air sprayer	1% DDT in fuel oil or emulsion in water	0.25 lb per acre
		Power sprayer		3 gal per acre
		Mist blower	5% oil solution	6 pints per acre
	DDT + BHC	Hand	Gelatin capsules	1 capsule per 750 sq ft
	Malathion			0.5 lb per acre
		Portable compressed- air sprayer	1% oil solution	6 gal per acre
		Power sprayer	5% oil solution	5 qt per acre
		Mist blower	"	"
Heavy vegetation, hay meadows	DDT			0.5 lb per acre
		Hand seeder	5% granules	10 lb per acre
		Aircraft	25% granules	5 qt per acre
				0.05 lb per acre
Flooded bottoms and other areas draining into streams	fenthion (Baytex)	Portable sprayer	0.5% oil solution or emulsion in water	2.5 gal per acre
Sewage lagoons	fenthion (Baytex)	Portable sprayer Power sprayer	2.5% oil solution "	0.1 lb per acre 5 gal per acre
Ornamental pools, rainbarrels, firebarrels	Pyrethrins	Hand sprayer	0.01% in water	14 fl oz per 100 sq ft

TABLE 2
FORMULATIONS AND EQUIPMENT FOR THE CONTROL OF ADULT MOSQUITOES BY VARIOUS METHODS

Method	Insecticide	Equipment	Formulation	Dosage
Space spraying indoors	DDT plus pyrethrins and synergist	Aerosol bomb	2-3% in oil solution	Spray 6-8 sec per 1000 cu ft
		Hand sprayer	0.5% in kerosene	$\frac{1}{2}$ fl. oz per 1000 cu ft
Space spraying outdoors (including fogging)	DDT	Aerosol generator	5% in oil solution	2 $\frac{1}{2}$ -5 pt per acre
	Mala	"	"	"
	Malathion	"	"	"
	DDT (not over lakes or streams)	Aircraft	5% or 10% in oil solution	5 or 2 $\frac{1}{2}$ pt per acre
Residual spray indoors	Malathion	"	5% in oil solution	1 qt per acre
	DDT	Hand sprayer	5% in oil solution	1 gal per 1200 sq ft
		Compressed sprayer	"	"
		Mist blower	"	"
Residual spray outdoors (on vegetation)	DDT	Portable sprayer	1% emulsion or suspension in water	10-20 gal per acre
		Power sprayer		
		Mist blower		
Residual spray outdoors (on buildings, not vegetation)	DDT	Portable sprayer	5% in oil solution	1 gal per 1200 sq ft
		Power sprayer		

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